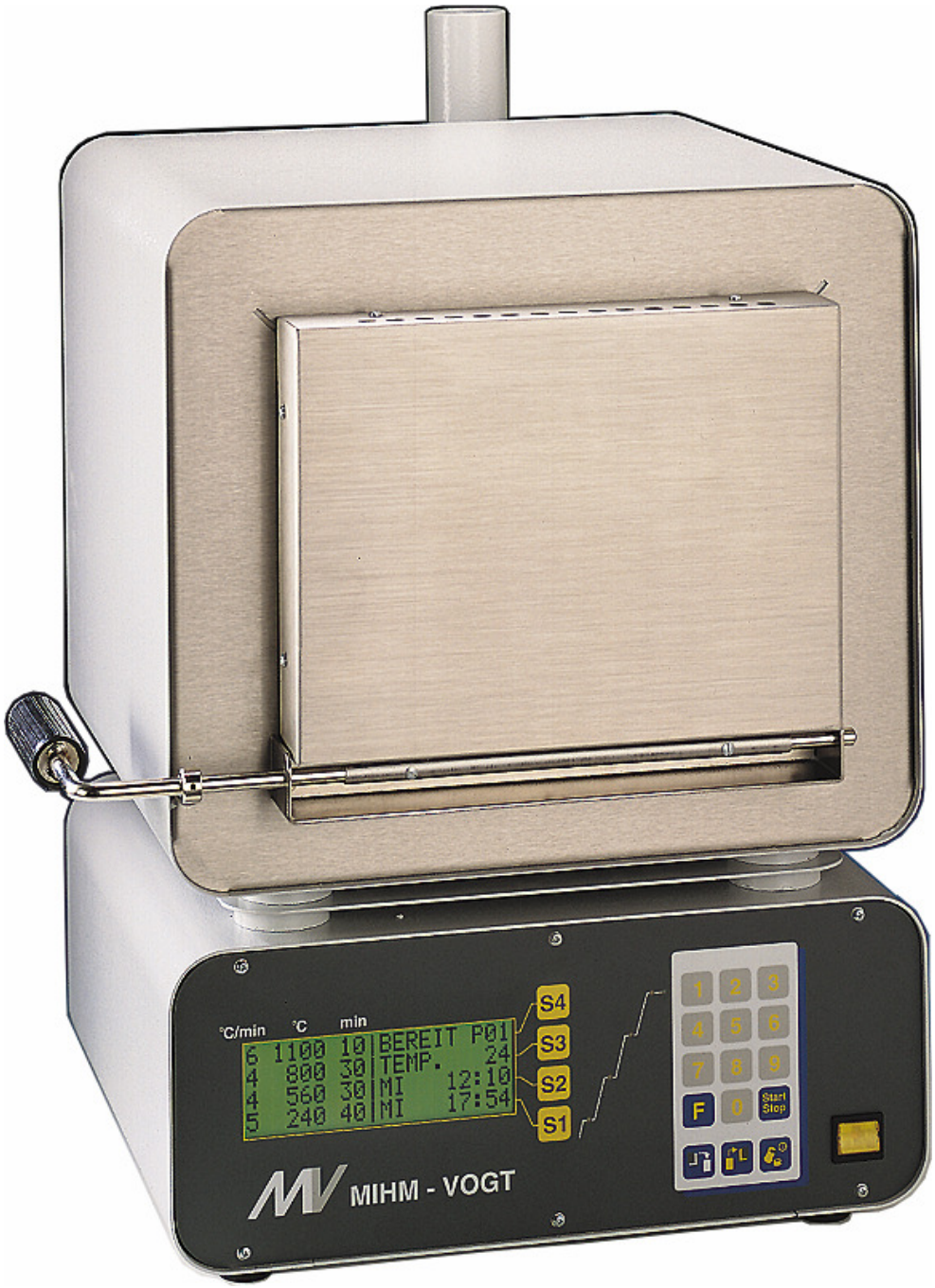

Operating Instructions

for MIHM-VOGT Laboratory Furnaces with Controller P6

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Operating Instructions

for

MIHM-VOGT Laboratory Furnace

with Controller P6

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Dear customer,

We thank you for your decision to buy a high-quality MIHM-VOGT furnace. It will support you with your work for many years, because it was developed and built using the latest technology.

Improper use can cause damage, therefore we ask you to carefully read through this working instructions and to follow it.

CE The CE-sign confirms that MIHM-VOGT laboratory furnaces correspond to the governing regulations of the EC guidelines.

1. Delivery form

Each laboratory furnace is delivered with a P6-controller, a ceramic tray, a PtRh-Pt thermocouple and an exhaust tube.

The furnace can also be equipped with the folling accessories:

- Exhaust blower DG2 (Art. No. 7202)
- Catalyzer KN (Art. No. 7300)
- Catalyzer for shock-heat investments KN2 (Art. No. 7320)

Spareparts	**Order No.:**				
Furnace type:	**KM**	**SL**	**GL**	**BL**	**TL**
Ceramic tray	20020	30020	40020	50020	50020
Thermocouple	20100	30110	30110	50110	30110
Door filling (without ventilator)	20301	30301	30301	30301	30301
Door filling (with ventilator)	20351	30301	30301	30301	30301
Heating muffle (without ventilator)	20010	30010	40010	50010	60010
Heating muffle (with ventilator)	20015	30015	40015	50015	60015

2. Use area

The laboratory furnace is used to eliminate wax and to preheat the dental casting ring. The heating muffle is made of high-quality heating wire and is heated evenly on four sides. The low electric burden guarantees a high lifespan of the heating wire. A high-quality inner isolation ensures low power consumption.

At the rear of the furnace two sockets are provided allowing connection of an exhaust blower, a catalyzer, or a fume extraction hood.

The furnace door is equipped with a switch that interrupts the heating current when opening the door. The P6-controller is equipped with a thermocouple circuit breaker so that the furnace does not overheat if the thermocouple is defective. At the rear of the furnace the furnace type is imprinted on a label.

3. Technical data

Ofentyp:	**KM**	**SL**	**GL**	**BL**	**TL**
Outside dimensions:	40 x 48 x 40	43 x 58 x 45	48 x 58 x 52	54 x 60 x 55	54 x 65 x 55
w x h x d (cm)	40 x 48 x 45	43 x 58 x 51	48 x 58 x 59	54 x 60 x 62	54 x 65 x 62
Heating chamber: w x h x d (cm)	15 x 10 x 17	18 x 11 x 19	20 x 11 x 25	25 x 11 x 28	25 x 17 x 28
Capacity:	4 pcs. of 6x	4 pcs. Ø 8 cm	6 pcs. Ø 8 cm	9 pcs. Ø 8 cm	18 pcs. Ø 8 cm
Max. Temperature:	1150 °C	1150 °C	1150 °C	1150 °C	1150 °C
	1100 °C	1100 °C	1100 °C	1100 °C	1100 °C
Power rating:	1.6 kilowatts	1.8 kilowatts	2.3 kilowatts	3.5 kilowatts	4.5 kilowatts
	1.6 kilowatts	2.1 kilowatts	2.6 kilowatts	3.7 kilowatts	4.8 kilowatts
Voltage:	230 V~	230 V~	230 V~	230/400 V~ (2/N)	230/400 V~ (2/N)
Preheating times:	60 min. 900 °C 90 min. 1050 °C	60 min. 800 °C 90 min. 1100 °C	60 min. 800 °C 90 min. 1100 °C	60 min. 800 °C 90 min. 1100 °C	60 min. 800 °C 90 min. 1100 °C
Weight:	32 kg	63 kg	75 kg	90 kg	100 kg
	36 kg	70 kg	80 kg	95 kg	105 kg

furnaces with circulating air

4. Safety warning

- The MIHM-VOGT laboratory furnace is exclusively designed for the elimination of wax and for the preheating of casting rings. We are not liable for damages due to another use. The sockets at rear are exclusively intended for the connection of a MIHM-VOGT fume extraction hood, a MIHM-VOGT exhaust blower, or a MIHM-VOGT catalyzer.
- The MIHM-VOGT laboratory furnace must be serviced exclusively by technicians who know the content of this working instructions. Labels and stickers on the laboratory furnace must always be maintained in legible condition. They must not be removed.

- The MIHM-VOGT laboratory furnace should be set up only in dry areas and should not get in contact with liquids. In the area of the furnace, furniture and other objects cannot consist of explosive, combustible or easily inflammable materials. In the installation area of the furnace, no easily inflammable or combustible gases or liquids are allowed to be stored.
- Modifications of the MIHM-VOGT laboratory furnace can only be made after prior written agreement from us. We are not liable for damages caused by your modifications. Before every maintenance, the appliance is to be turned off and the power-supply plug is to be pulled out.
- The furnace must always be connected to a separate circuit protected by a 15/16 Amp fuse.
- The hot furnace door should only be touched at the grip; the hot muffles should only be touched with sufficiently long tongs. Because of the wax fumes and the steam from casting rings, the furnace should be equipped with an exhaust blower or catalyzer and placed under a fume extraction hood. The fumes are to be extracted to the outside.
- The ceramic tray is to be used to protect the heating muffle. The furnace must never be used without the ceramic tray. Cracked or damaged ceramic trays must be replaced immediately.
- The transportation protection of the heating muffle must be taken off before the first use.

5. Installation and electrical connection

The laboratory furnace is to be positioned in a dry area in accordance with the safety warnings, and it is to be connected to a separated circuit secured with 15/16 Amp. The transportation protection is to be removed from the heating muffle. The laboratory furnaces type KM, SL and GL are to be connected to an earthed plug 230 V, the laboratory furnaces type BL and TL are to be connected to a CEKON plug 230/400 V AC. If necessary, the exhaust blower DG2 or the catalyzers KN / KN2 are installed on the furnace rear. They are to be connected into the socket marked 'Gebläse'.

6. Start-up

6.1 Start-up

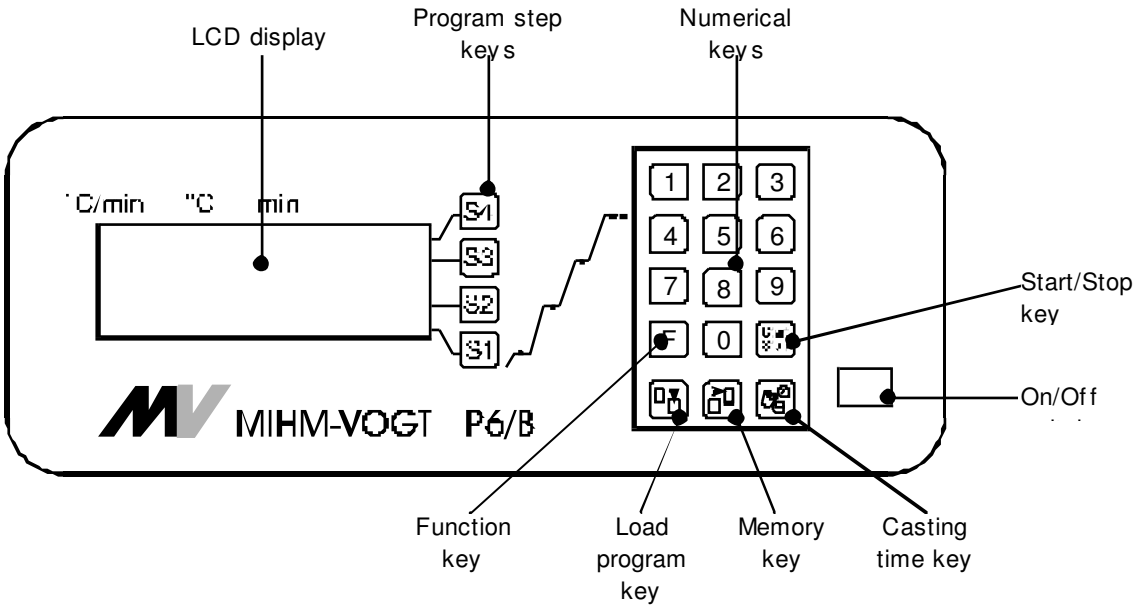
Prior to the first use, the muffle must be heated up on 1050°C for 90 minutes. This way, the necessary oxide layer is formed on the heating wire.

6.2 Loading

The casting muffles are to be put on the ceramic tray. Metal muffle rings should not come in contact with the lateral walls.

6.3 Service of the controller

The time-schedule controller is equipped with the most modern microprocessor technology, that allows the heating process to go through a wide variety of programs with precision. The furnace is programmed on a menu-driven keyboard with LCD indicators. The following functions are available:



6.3.1 Function keys

Start Stop — **Start/Stop key:** to start or stop the current program

Load program key: to load a program from the memory

Memory key: to store a program entered into memory

Casting time key: to set the casting time

F — **Function key:** to set the parameters

1 ... 9 — **Numeric keys:** to enter the values desired

S1 ... S4 — **Program step keys:** to activate the cursor

6.3.2 Setting of individual programs

Immediately after switching on the furnace, a display appears indicating information on the system. Within a few seconds the stand-by display appears instead:

Example:

°C/min	°C	min			
3	1050	30	STNDBY	P01	— **S4**
0	0	0	TEMP.	22	— **S3**
6	520	10	MO	12:13	— **S2**
4	280	30	MO	18:32	— **S1**

On the left side, the furnace program is indicated where lines 'S1' to 'S4' stand for the according steps 1 to 4 to be programmed accordingly. In the column '°C/min' the heating speed is determined, in '°C' the temperature is set, and in the column 'min' the delay of the according step is indicated. The furnace is heated in up to four temperature steps. It is possible to heat and cool down within one program. There are no preset programs when leaving the factory.

Individual programs are entered as follows:

1.) Choosing of a program number / Loading of a porgram:

After activating the load program key, the display "load program" appears. The cursor is set to the field "program number". Now the program number desired is either entered by the numeric keys or searched by scrolling down using the 'S4' key.

LOAD PROGRAM	P13	— **S4**
		— **S3**
	YES	— **S2**
	NO	— **S1**

Pressing the 'S2' key activates the loading process = 'yes', then the stand-by display appears. To quit the menu earlier, press 'S1' = 'no'.

2.) Entering of a program:

On pressing 'S1' the cursor shows up in the column '°C/min'. The numeric keys ('0' - '9') are used to enter the heating speed. Then the cursor moves on to the column '°C'. Here a 4-digit holding temperature has to be entered (e.g.: '0280'). If only a 3-digit value (or less) is entered, 'S1' has to be pressed to confirm it and to move the cursor to the column 'min'. There the holding time is determined.

Steps 'S2' to 'S4' are programmed in the same way. If one step is not required, set all values in this line on '0'.

°C/min	°C	min		
3	1050	30	STNDBY P01	— **S4**
0	0	0	TEMP. 22	— **S3**
6	520	10	MO 12:13	— **S2**
4	280	30	MO 18:32	— **S1**

IMPORTANT: Steps 'S1' to 'S3' may be set to '0'; however, in step 'S4' a certain temperature **must** be entered. Choosing '0' as heating speed ('°C/min'), the furnace heats up at maximum energy (non-linear).

3.) Storing of a program:

After entering a program via the keys 'S1' to 'S4', the memory key is to be pressed to store the according data. The display indicates the following menu:

STORE PROGRAM P13	— **S4**
	— **S3**
YES	— **S2**
NO	— **S1**

Data is stored by pressing the 'S2' key = 'yes'. Pressing 'S1' = 'no' stops the menu, and the stand-by display appears again.

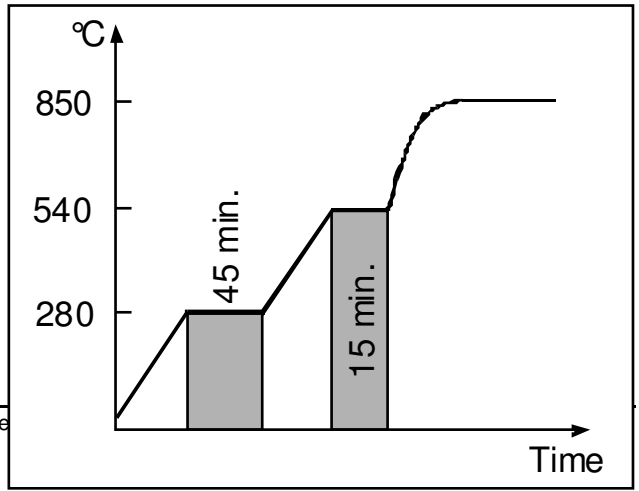
The program is stored under that program number which was entered on loading.

6.3.3 Examples of programming

Example of programming: 3-step heating

	Heating speed	*Temperature*	*Holding time*
	°C/min.	*°C*	*Min.*
Step 4:	*0*	*850*	*60*
Step 3:	*0*	*0*	*0*
Step 2:	*6*	*540*	*15*
Step 1:	*4*	*280*	*45*

1.) Selection of the program number (e.g. No. '01'): Press the load program key



and enter the program number '01'. Confirm by pressing 'S2' = 'yes'.

LOAD PROGRAM P01	— **S4**
	— **S3**
YES	— **S2**
NO	— **S1**

2.) Pressing the 'S1' key lets the cursor show up in the field '°C/min.' = heating speed. Enter '4' using the numeric keys. Then, the cursor automatically goes on to the field '°C' = temperature. Enter '0280' here; the cursor automatically goes to the field 'min' = holding time. Here '45' is to be entered. (In case just '280' was entered in the temperature field, this value has to be confirmed with the 'S1' key.)

°C/min	°C	min			
0	0	0	STNDBY	P01	— **S4**
0	0	0	TEMP.	22	— **S3**
0	0	0	MO	12:13	— **S2**
4	280	45	MO	15:45	— **S1**

3.) Steps 'S2' and 'S4' are set in the same way. Since in this example step 'S3' is not required, all values are set to '0' in this line.

°C/min	°C	min			
0	850	60	STNDBY	P01	— **S4**
0	0	0	TEMP.	22	— **S3**
6	540	15	MO	12:13	— **S2**
4	280	45	MO	18:32	— **S1**

4.) The program is stored by pressing the memory key,

confirm with 'S2' = 'yes'.

STORE PROGRAM P01	— **S4**
	— **S3**
YES	— **S2**
NO	— **S1**

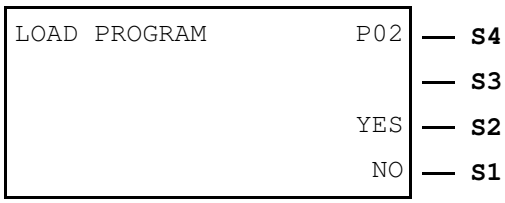
Example of programming: Shock heat

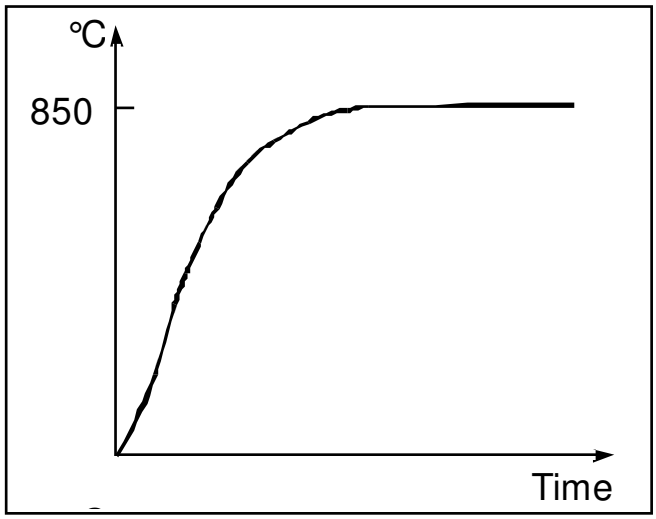
	Heating speed	*Temperature*	*Holding time*
	°C/min.	*°C*	*Min.*

Step 4:	*0*	*850*	*0*
Step 3:	*0*	*0*	*0*
Step 2:	*0*	*0*	*0*
Step 1:	*0*	*0*	*0*

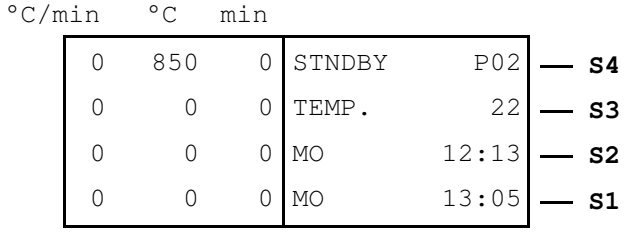
1.) Selection of a program number, for example No. 2: Press the load program key

and enter the Program number '02'. Confirm with 'S2' = 'yes'.



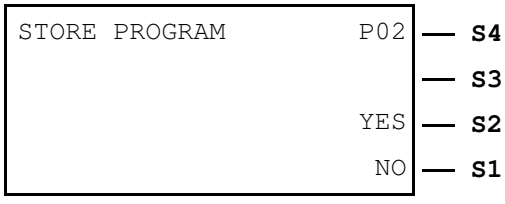


2.) Pressing the 'S4' key lets the cursor show up in field '°C/min.' = heating speed. Enter '0' using the numeric keys or press 'S4' to move to the next field '°C' = temperature. Enter '0850' here; the cursor automatically goes to the field 'min' = holding time. Here '0' is to be entered. Alternatively, the 'S4' key may be used to move to the next field.



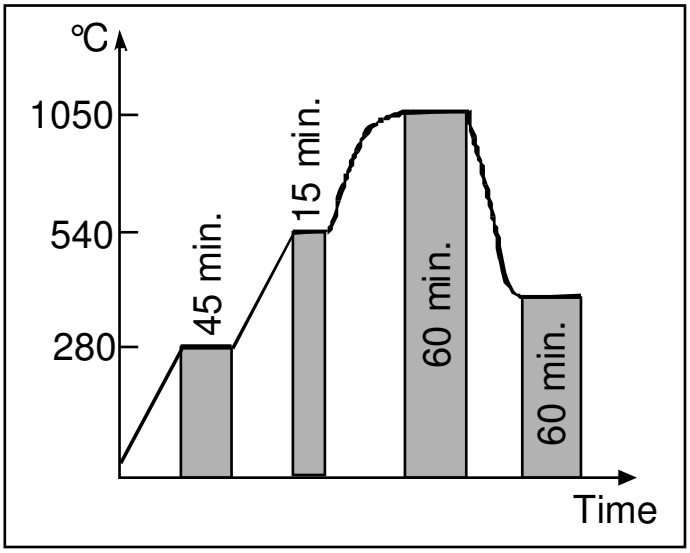
5.) The program is stored by pressing the memory key,

then confirmed with 'S2' = 'yes'.



Example of programming: 3-step heating with cooling step

	Heating speed	*Temperature*	*Holding time*
	°C/min.	*°C*	*Min.*
Step 4:	*0*	*430*	*60*
Step 3:	*0*	*1050*	*60*
Step 2:	*6*	*540*	*15*
Step 1:	*4*	*280*	*45*



1.) Selection of a program number (e.g. No. '03'): Press the load program key

and enter the program number '03'. Confirm by pressing 'S2' = "yes".

```
LOAD PROGRAM          P03   — S4
                            — S3
                      YES   — S2
                      NO    — S1
```

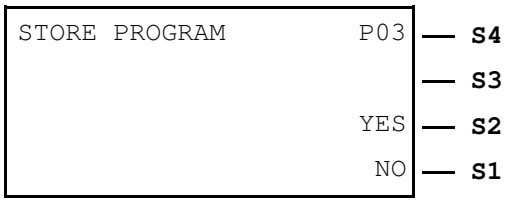
2.) Pressing the 'S1' key lets the cursor show up in the field '°C/min.' = heating speed. Enter '4' using the numeric keys. Then, the cursor automatically moves on to the field '°C' = temperature. Enter '0280' here; the cursor automatically goes to the field 'min' = holding time. Here '45' is to be entered. (In case just '280' was entered in the temperature field, this value has to be confirmed by pressing the 'S1' key.)

°C/min	°C	min			
0	430	60	STNDBY	P03	— S4
0	1050	60	TEMP.	22	— S3
6	540	15	MO	12:13	— S2
4	280	45	MO	20:24	— S1

3.) Steps 'S2', 'S3' and 'S4' are set in the same way.

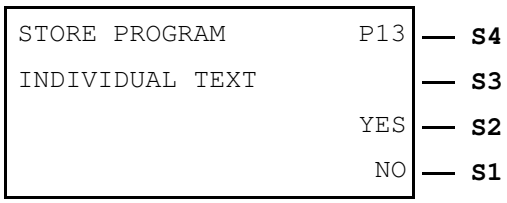
4.) The program is stored by pressing the memory key

and confirmed with 'S2' = 'yes'.



6.3.4 Setting of individual text

In addition to the program stored, individual text may be entered and stored as well. Therefor the memory key is pressed to open the store program display (see 6.3.2):

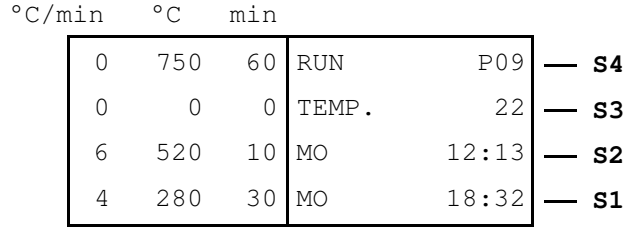


The 'S3' key lets the cursor show up in the according line. By pressing the 'Start/Stop' key, the letters 'A', 'B', 'C', ... appear in alphabetical order. The letter needed is confirmed with 'S3'. This process may be continued until the text desired is complete (max. 19 letters). Figures are entered via the numeric keys '0' ... '9'.

These data are stored by pressing the 'S2' key = 'yes'. By pressing 'S1' = 'no' the menu is quit, and the stand-by display appears again.

6.3.5 Starting of a program

After pressing the 'Start/Stop' key to start the process, the stand-by display appears. The line 'S4' now shows the word 'RUN' instead of 'STNDBY'.

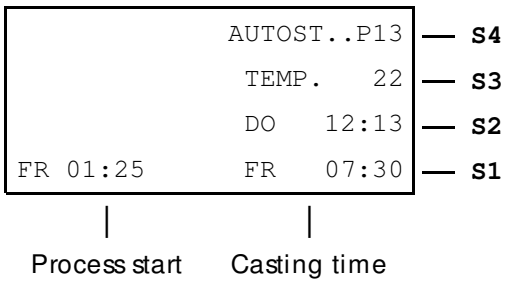


Flashing or illumination of the stage-LCD shows that a process is running. During the

process, the stages passed are deleted when finished. The process may be stopped by pressing the 'Start/Stop' key.
The current temperature is indicated in line 'S3'. Line 'S2' shows the actual time (and day), and line 'S1' indicates the expected end of the program.

6.3.6 Start of a program with the delay start feature

First, the program desired is loaded via the load program key (see 6.3.3). When pressing the casting time key, the following information appears on the display:



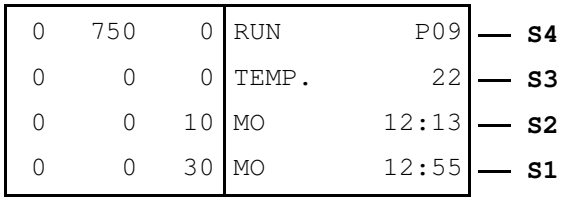
Pressing the 'S1' key allows to determine the casting time desired (= program end). The day is set at first using the numeric keys (Monday = 1, Tuesday = 2, Wednesday = 3, ... Sunday = 7). Then the program end desired (hh:mm) is entered via the numeric keys. In the left column of line 'S1' the display then shows the program's start time . The delay start feature is now activated; no more keys are to be pressed.

6.3.7 Optional step (Final temperature)

If casting muffles for different final temperatures, e.g. for 750 C and 850 °C, are to be preheated at the same time, set the temperature for the 3rd step on 750 °C as described under 6.3.3. The program is changed by a long pressure on the 'S4' key after completion of the first program. The temperature in the 3rd step can now be raised, e.g. to 850 °C. The controller automatically repeats the last heating step and then heats up to the new temperature set (850 °C). The final temperature may be changed as often as required. The original parameters of the program remain untouched.

Alternatively it is possible to extend the according holding time of the last step which is recommended especially in case of shock-heat investments. Therefor the furnace is heated up as follows:

Example:



An acoustic signal is audible as soon as the final temperature of 750 °C is reached. Now the shock-heat muffles are placed into the furnace. By pressing the 'S4' key the holding time is extended as follows:

0	750	60	RUN	P09	— **S4**
0	0	0	TEMP.	22	— **S3**
0	0	10	MO	12:13	— **S2**
0	0	30	MO	12:55	— **S1**

The 60 minutes entered start running now. When finished, an acoustic signal sounds again, and the muffles are ready to be cast.

WARNING: Do not interrupt the program by pressing the „Start/Stop“ key!

6.3.8 Continuous operation of the rear sockets in case of shock-heat investments

A P6-controller with software version 02.55 and later (see information of the controller as per 7.1 of these working instructions) allows to individually program the sockets on continuous function when using shock-heat investments.

It is sensible to use an exhaust blower, a catalyzer or a fume extraction hood therefor ensuring that these appliances are running as long as the muffles are in the furnace. Especially if a catalyzer is used, this function guarantees that it reaches its optimum operating temperature.

Continuous operation of the sockets at the P6-controller is activated, when storing a program (see topic 6.3.2 of the P6 instructions), by a pressure on the 'S4' key. The display then indicates 'Shock heat':

STORE PROGRAM	S13	— **S4**
		— **S3**
SHOCK HEAT	YES	— **S2**
	NO	— **S1**

This function may be deactivated by another pressure on the 'S4' key.
Data is stored by pressing the 'S2' key = 'yes'. Pressing 'S1' = 'no' stops the menu, and the stand-by display appears again.

Example of programming: Shock heat program with continuous operation of catalyzer (or exhaust blower or fume extraction hood)

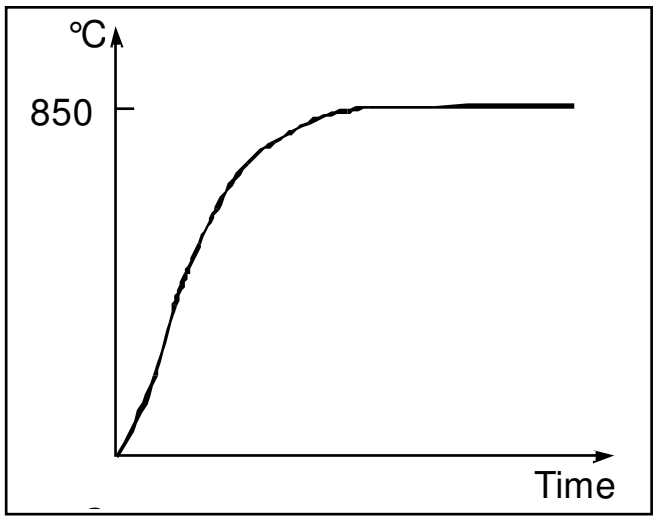
	Heating speed	*Temperature*	*Holding time*
	°C/min.	*°C*	*Min.*
Step 4:	*0*	*850*	*0*
Step 3:	*0*	*0*	*0*
Step 2:	*0*	*0*	*0*
Step 1:	*0*	*0*	*0*

1.) Selection of a program number, for example No. 2: Press the load program key

and enter the program number '02'. Confirm with 'S2' = 'yes'.

LOAD PROGRAM	P02	— **S4**
		— **S3**
	YES	— **S2**
	NO	— **S1**

2.) Pressing the 'S4' key lets the cursor show up in field '°C/min.' = heating speed. Enter '0' using the numeric keys or press 'S4' to move on to the next field '°C' = temperature. Enter '0850' here; the cursor automatically moves to the field 'min' = holding time. Here '0' is to be entered. Alternatively, the 'S4' key may be used to move to the next field.



°C/min	°C	min			
0	850	0	STNDBY	P02	— **S4**
0	0	0	TEMP.	22	— **S3**
0	0	0	MO	12:13	— **S2**
0	0	0	MO	13:05	— **S1**

3.) After pressing the memory key

the 'Store program display' appears. A pressure on 'S4' provides permanent tension at the sockets so that the appliances connected, e.g. a catalyzer, run continuously when the furnace is switched on. The display indicates 'Shock heat'. This function may be deactivated by another pressure on 'S4'.

STORE PROGRAM	S02	— **S4**
		— **S3**
SHOCK HEAT	YES	— **S2**
	NO	— **S1**

'S2' = 'yes' stores the program.

7. Special functions

7.1 Information at starting

When switching on the furnace, the following information is shown on the P6-controller for 3 seconds:

MIHM-VOGT		— **S4**
V02.57		— **S3**
P6B-SN:	43843/1	— **S2**
DOSB-SN	4240/7	— **S1**

Line 'S3': Number of the software version (here version 02.57)

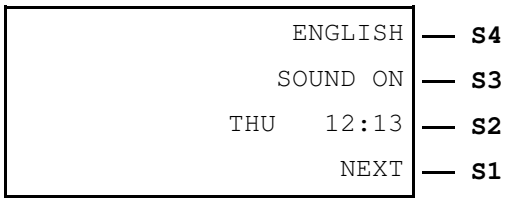
Line 'S2': Serial number of the furnace (here No. 43843) and parameters of the controller (here controller parameter 1 = KMP6, 2= SLP6 ... TLP6)

Line 'S1': Serial number of the electronics (here No. 4240) und hardware version (here No. 7)

In case of older P6-controllers, this information may differ slightly. If so, please contact MIHM-VOGT to get the according details.

7.2 Function key 'F'

Function key 'F' is used to adjust the individual requirements of your P6-controller.

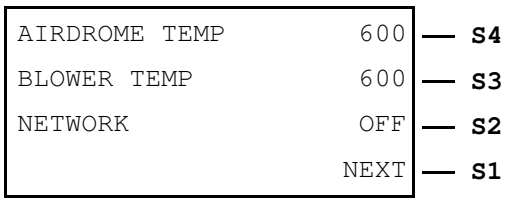


Key 'S4': With 'S4' the display language is changed.

Key 'S3': An acoustic signal indicates the end of the program. If you do not want this acoustic signal in general, you may turn it off by pressing the 'S3' key. (The acoustic signal also stops when opening the door of the furnace).

Key 'S2': With 'S2' the integrated clock is set where Monday = 1, Tuesday = 2 ... Sunday = 7. The current time is to be altered manually with the summer/winter time switch!

Key 'S1': 'S1' is used to go on further:



Key 'S4': Airdrome temperature at the socket marked 'Dunst' [standard = 600 °C]

Key 'S3': Blower temperature at the socket marked 'Gebläse' [Standard = 600 °C]

Key 'S2': This key is only needed if the controller is furnished with an interface to be connected to a network.

Key 'S1': This key is used to quit the menu and to store the settings made.

ATTENTION *(Regarding software version 02.54 or before)*: If shock-heat investments are used and an exhaust blower, a catalyzer or a fume extraction hood are connected, the shutoff temperature of the sockets 'Dunst' (= exhaust) or 'Gebläse' (= ventilator) should be approximately 20 °C higher than the programmed final temperature for the shock-heat investment (example: If the final temperature for shock-heat investments is 850 °C, the shutoff temperature should be at 870 °C). Thus, the above mentioned appliances run continously when the furnace is switched on.

7.3 Correction program

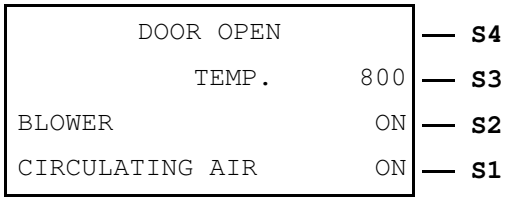
The calculation of the start time (casting time function for the delay start feature is based on an average tension of 230V. Start and finishing times may vary according to local voltage. Severe variations (of more than 30 minutes) may be adjusted by means of the correction program.

The correction program is accessed by loading the program '00'. In case of older P6-models (software version 01.xx), the correction program is stored as No. '99'. The correction program itself may not be altered.

ATTENTION: The complete program lasts approximately 8 hours!

7.4 Cooling function with exhaust blower / circulating air *(version 1.20 and later)*

At the end of the program, pressing the 'S2' key activates the exhaust blower, if connected, and pressing the 'S1' key switches on the air circulation fan for a fast cooling process (only possible in case of furnaces with integrated air circulation).



7.5 Controller initialisation

In order to guarantee optimal performance with the various laboratory furnaces, different parameters are preset . The controller is reset to factory settings with the following keystroke, and the according parameters are activated:
The furnace must indicate 'STNDBY':

- Keystroke: 'F' '8' '5' '4' '0' parameters of furnace types KM
- Keystroke: 'F' '8' '5' '5' '0' parameters of furnace types SL .. TL

ATTENTION: The controller parameters may **not** be altered without agreement of MIHM-VOGT, Karlsruhe/Germany!

7.6 How to connect exhaust blowers, catalyzers and/or fume extraction hoods

a.) Connection of an exhaust blower:
The exhaust blower type DG2 is inserted into the designated space at the back and fixed at the rear sheet metal with the according screws. If an exhaust pipe is connected, this has to be removed. Connect the plug at the rear socket marked 'Gebläse'.
If required, the exhaust blower can be extended up to approx. 3 - 5 m using conventional metal pipes (with a diameter of 80 mm at least). Please see to it that the air resistance is kept low (make only a few angles and do not use flaps) since otherwise the air flow in the blower might change its direction and, thus, suction stops.

In case of shock-heat investments, please ensure that the blower runs throughout the complete preheating process of the casting muffles. If required, the shutoff temperature of the sockets have to be changed (see point 6.3.8 and 7.2).

b.) Connection of a catalyzer:

The adapter supplied for the catalyzer type KN or KN2 is inserted into the designated space at the back and fixed at the rear sheet metal using the according screws. If an exhaust pipe is connected, this has to be removed. The suction pipe of the catalyzer has to be attached to the adapter and secured with the counter screw. Connect the plug at the rear socket marked 'Gebläse'.

It is recommendable to operate the catalyzer under a fume extraction hood exhausting the fumes either into a chimney or to the outside. The catalyzer may be extended in the same way as a blower; then an additional ventilator (type ZL, order No. 73010, or type ZL2, order No. 73210) must be installed inside the pipe. With this measure, the catalyzer's pipe may be extended up to approx. 3 - 5 m (diameter for KN 120 mm at least, diameter for KN2 150 mm at least). Please see to it that the air resistance is kept low (make only a few angles and do not use flaps) since otherwise the air flow in the blower may change its direction.

In case of shock-heat investments, please ensure that the blower runs continuously throughout the complete preheating process of the casting muffles. If required, the shutoff temperature of the sockets has to be changed (see points 6.3.8 and 7.2).

In dental technology, gases of burnt wax (= organic hydrocarbons) are the main components which are emitted when heating investments or casting muffles. These gases are burnt again in the catalyzer and split into carbon dioxide (CO_2) and water steam (H_2O). In case of higher temperatures, some investments may release also ammonia gases which the catalyzer transforms into different nitrogen oxides (NO_x). As not all manufacturers of investments and waxes give complete information on additional components, it is impossible to name all remainders of other contents released and their composition.

c.) Connection of a fume extraction hood:

A fume extraction hood used together with the laboratory furnace can be controlled via the socket marked 'Dunst'. Using shock-heat investments requires continuous operation of the fume extraction hood during the complete preheating process of the casting muffles. The shutoff temperature of the rear sockets might have to be altered (see points 6.3.8 and 7.2). If the fume extraction hood is controlled by several furnaces, a furnace adapter / relay connection must be used:

MIHM-VOGT furnace adapter:	furnace control only	with switch: *furnace control / mains control*
Connection of up to 3 furnaces:	OA3, Art. No.: 7553	OA31, Art. No.: 7555
Connection of up to 4 furnaces:	OA4, Art. No.: 7554	OA41, Art. No.: 7556

8. Error signals

8.1 Error messages of the electronics

If errors occur, an according error message is indicated in the display accompanied by an acoustic signal.

Error signals:	Cause:	Elimination:
"Sensor defekt"	Thermocouple connections are loose.	Check thermocouple connections.
	Thermocouple defective.	Change the thermocouple.
"Sensor + <-> -"	Thermocouple is incorrectly attached.	Shift thermocouple connections.
	Temperature inside the heating muffle is significantly below room temperature.	Open the door and wait until the heating muffle has reached room temperature.
Automatic switchoff as a safety feature	Furnace temperature exceeds 1200 °C.	Switch off the furnace manually as well and let cool down. Call the customer service.

8.2 Further errors and their causes

Error signals:	Cause:	Elimination:
Controller shows wrong time	Wrong time on the controller.	Correct time in accordance with point 7.2.
Malfunction of the heating speed	The 'Start/Stop' key was pressed by accident.	Enter a new program with final temperature as the only parameter.
Heating has not started although autostart program runs	Power was out during autostart program.	Check the power connection and ensure that no timer is interposed.
Controller indicates: "Door open" when door is shut.	Door-switch sticks or is defective.	Check door-switch. Call customer service if necessary.

Error signals:	Cause:	Elimination:
Light-emitting diode at the controller indicates heating but furnace does not heat.	Heating muffle is defective (measure resistance of the heating muffle with ohmmeter [$R_{o.k}$= 18 .. 30 Ω]).	Heating muffle is defective. Change it. Call customer service if necessary.
	Controller is defective.	Replace the controller. Call customer service if necessary.
	Power element is defective (furnace type BLP6[-U] or TLP6[-U] or older P6 version).	Replace the power element. Call customer service if necessary.

Controller "forgets" the programs stored.	Controller is defective.	Replace the controller. Call customer service if necessary.
Controller "forgets" the time	Controller is defective.	Replace the controller. Call customer service if necessary.
Displays are not working. Yellow pilot light of On/Off switch is on. LCDs just flash at switching on.	Display of the controller is defective.	Replace the controller. Call customer service if necessary.
Displays are not working. Yellow pilot light of On/Off switch is on. LCDs do not flash at switching on.	Protection fuse of the furnace is defective.	P6/B: Turn off the furnace, wait for 30 seconds, switch on again. If this does not help, replace the controller. Call customer service if necessary. P6 (older versions): Remove the controller and check the fuse in the fuse holder on the board.
Displays are not working. Yellow pilot light of On/Off switch is off.	No mains voltage.	Check fuses in the circuit breaker box, check connection management. Call customer service if necessary.
DG2, KN, or KN2 is connected but not working.	Attachment has no tension.	Check fuses in the furnace sockets as well as parameter settings (function key 'F') of the attachments.
DG2, KN, or KN2 do not work. Fumes are not extracted.	Air resistance in the exhaust pipe is too high.	Check exhaust pipe. Enlarge size, if necessary, and/or insert an additional ventilator.
Fume extraction hood is connected but not working.	Fume extraction hood has no tension.	Check fuses in the furnace sockets as well as parameter settings (function key 'F') of the attachments.
Furnace activates the circuit breaker in the switchbox	If the furnace is equipped with a catalyzer, the catalyzer may be defective.	Pull the catalyzer plug out of the socket. If the circuit breaker is now no longer activated, the heating of the catalyzer may be defective; return the catalyzer for repair.
	Because of wax fumes, too much carbon has settled in the insulation; leakage current flows from the heating to the housing activating the circuit breaker.	To burn the carbon in the insulation, the furnace is connected to a plug that is not protected by a circuit breaker, heated up on 1050 °C and held for approx. 3 hours. If this does not help, change the insulation and call customer service if necessary.

9. Maintenance and care

9.1 Care

- The chamber area should be kept clean. The ceramic tray is to be used and must not be cracked.
- The muffles are to be put into the furnace so that no contact with the walls exists.
- The furnace is to be heated up empty on 1050 °C before the first use; this temperature is to be held for 1.5 hours (= 90 minutes). This process should be repeated, especially if the furnace is used to burn out wax, every 14 days in the first three months of operation. Later, repeat this process every four weeks.
- If the furnace is used to burn out wax, it is recommended to use an exhaust unit or a catalyzer to evacuate the wax steams.

9.2 Maintenance

Warning:

Turn off the furnace and pull out the power-supply plug before every maintenance**!**

Attention:

The laboratory furnace insulation (lining) contains ceramic fibre / aluminium silicate fibre particles. According to the EU classification of December 5, 1997, this fibre must be declared as “carcinogen category 2 according to EU Directive 97/69/EC” (substances to be regarded as carcinogenic for humans). Animal experiments have shown that high exposure to dust can cause diseases of the lung or pleura in the form of fibrosis or cancer. These findings have **not** been confirmed in human studies. Critical health impairment is unlikely if the recommended instructions for use and valid limit values are observed.

Examples for European limits:

Country	Limit	Origin
Germany	0,5 F/ml	TRGS 900
France	0,6 F/ml	Circulare DRT nr. 95-4 du 12.01.95
Great Britain	2,0 F/ml	HSE - EH40, maximum exposure limit

It is unlikely that these limit values will be reached during servicing of the laboratory furnace. It is nevertheless recommended that respiratory masks type FFP2 are worn on a voluntary basis.

9.2.1 How to change the thermocouple

- **Pull the power-supply plug out!**
- Only for furnace with circulating air: unscrew the protection covering the motor of the ventilator.
- Loosen the connections of the thermocouple head. Unscrew the thermocouple from the rear wall and take it out.
- Insert the new thermocouple and screw it on the rear wall. Connect the new thermocouple correctly: red cable at +, white cable at -!

9.2.2 How to change the heating muffle

- **Pull the power-supply plug out!**
- Only for furnace with circulating air: unscrew the protection covering the motor of the ventilator. Take out the ventilator as described under 9.2.6.
- Unscrew upper and lower rear wall. Loosen the connnection of the heating wires in the sub box.
- Carefully take out the insulating material. Pull out the heating muffle carefully.
- Put in the new heating muffle, (IMPORTANT: for furnace type BL, put the ceramic tray in the heating muffle before introducing the heating chamber!). Connect the new heating muffle.
- Put the insulation material back and fix the upper and lower wall again.
- For furnace with circulating air only: install the air circulation fan as described under 9.2.6. Screw on the protective cover of the fan motor.

9.2.3 How to change the door-stone

- Loosen the cross-recessed screw and remove the hold sheet metal. Take out the door-stone.

9.2.4 How to replace the controller

- **Pull the power-supply plug out!**
- Loosen the cross-recessed screws from the front electronic (controller component) and take it out.
- Remove plugs and plug-in strips at the controller. Loosen the thermocouple connection wire. Proceed accordingly in reverse order to put in the new front electronic unit. Do not mix up the thermocouple connections

  (red = „+“, white = „-“).

9.2.5 How to replace the power element of the 2nd heating circuit (only for furnace types BL, TL)

- **Pull the power-supply plug out!**
- Take the ceramic tray out of the heating chamber, put the furnace on its side, unscrew the metalplate at the bottom.
- Remove the plug-in strips from the power element and unscrew it.
- Proceed accordingly in reverse order for reassembly.

9.2.6 How to change the air circulation fan

- **Pull the power-supply plug out!**

Laboratory furnace type KM:

- Unscrew the cover of the fan.
- Unscrew the mounting sheet metal with the fan from the rear wall. Take those and the heating muffle out.
- Reverse the procedure to reassemble the air circulation fan. Propeller should not be overtightened. It must be able to run freely. File the hole if necessary.

Laboratory furnace type SL... TL:

- Unscrew the cover of the ventilator. Extract the protection basket in the heating chamber.
- Hold tightly the motor of the ventilator and unscrew the propeller in the heating muffle from the motor axle. **WARNING: anti-clockwise threads!** If Propeller axle should be stuck, spray it with penetrating oil and let work. Call customer service if necessary.
- Unscrew the ventilator motor at rear.
- Reverse the procedure to reassemble the air circulation fan. Propeller should not be overtightened. It must be able to run freely. File the hole if necessary.

9.3 Warranty

1. Mihm-Vogt guarantees, under the following conditions, that its dental appliances are free of defects in accordance with the latest technological findings for the appliance in question for a period of 12 months from delivery of the appliance by the specialist dealer, provided that this occurs no later than six months after delivery from the factory.
2. The warranty covers only the repair of the dental appliance free of charge by a Mihm-Vogt specialist dealer. The parts incorporated in the appliance during the repair will be subject to the same warranty as that of the appliance itself until expiry of said

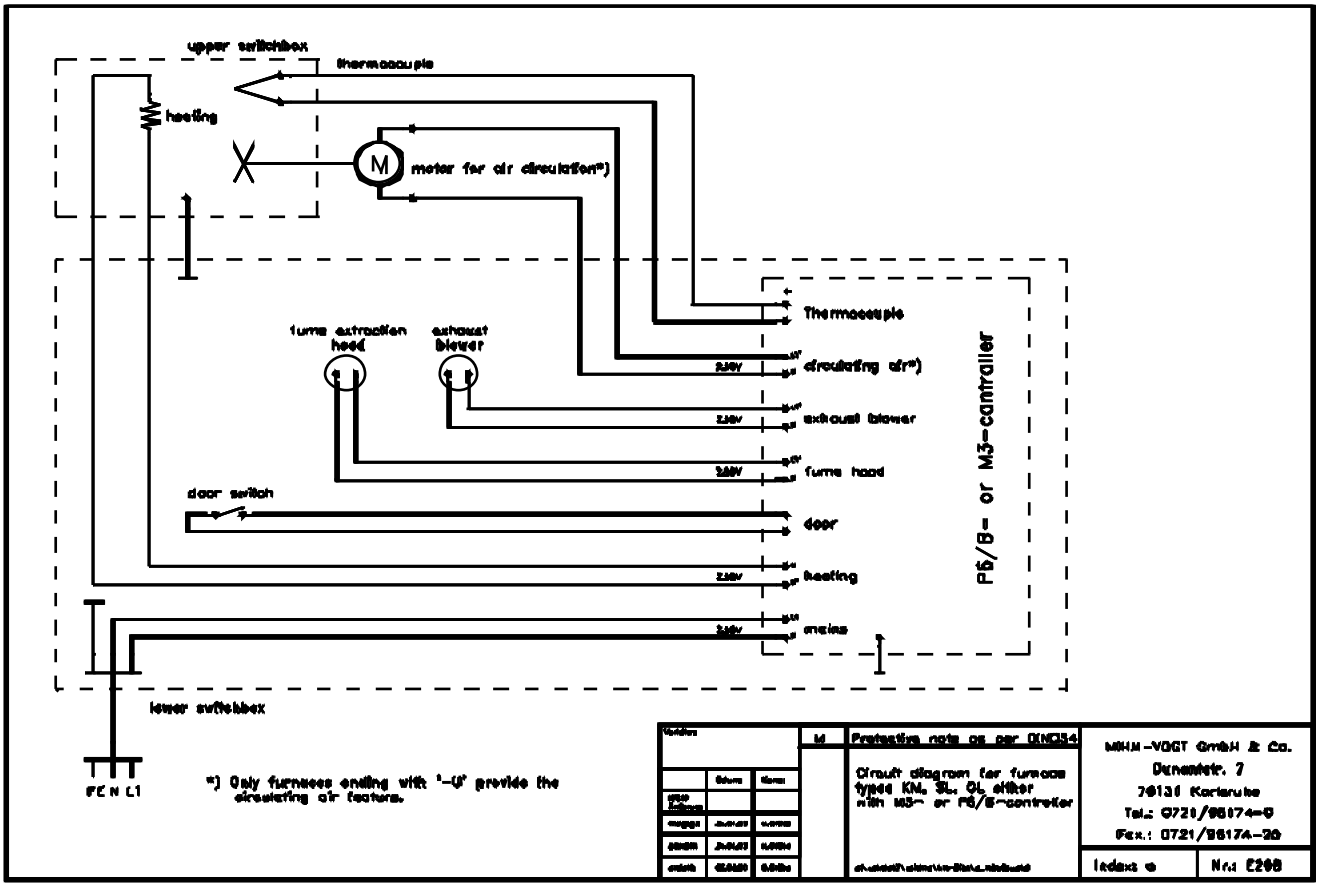
warranty in accordance with No. 1. Replaced parts will become the property of Mihm-Vogt.

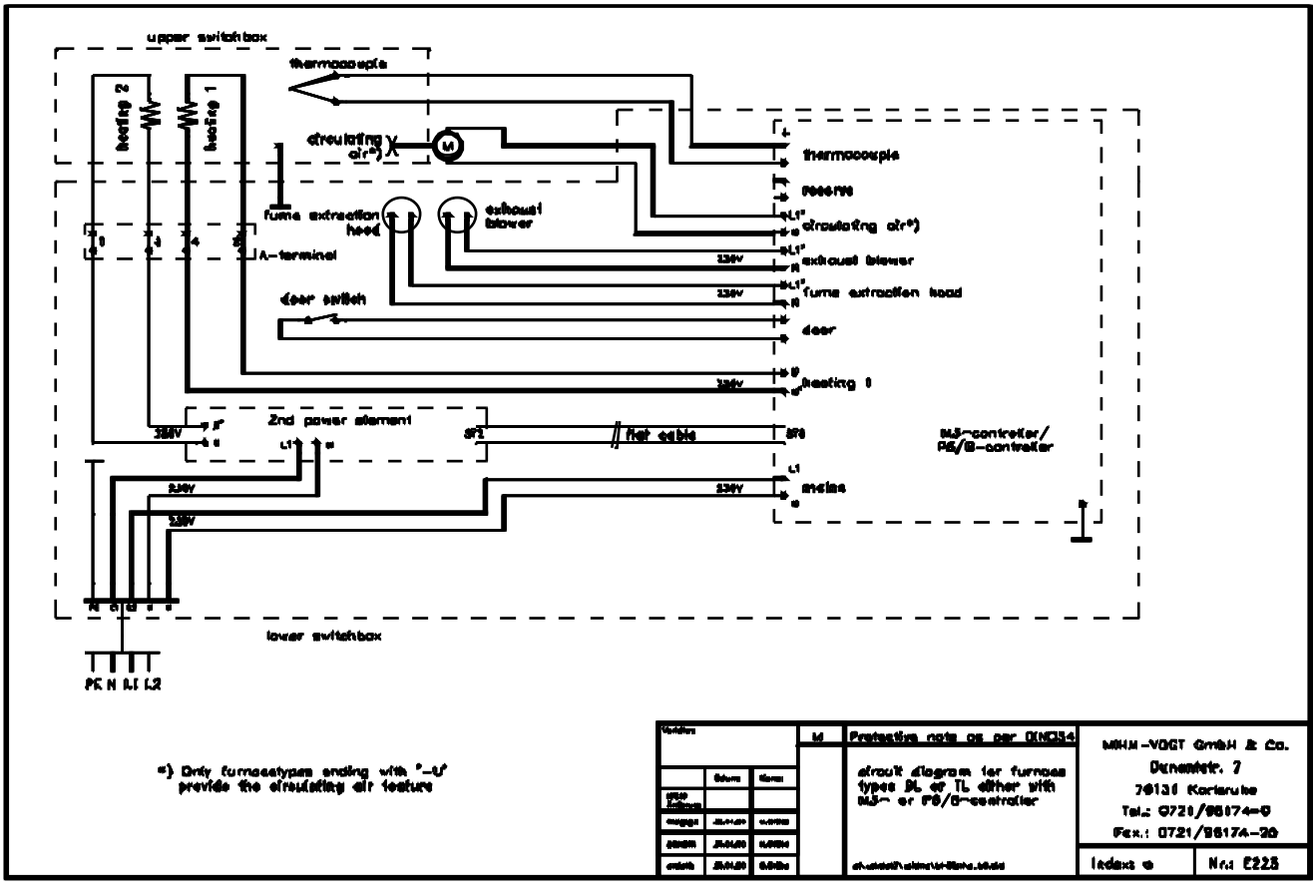
3. Guarantee claims are to be submitted with the invoice to a Mihm-Vogt specialist dealer who will carry out the repair.
4. Wear and tear, particularly to wear parts such as heating elements, bulbs, fans, and thermo-elements, are not covered by the warranty.
5. Guarantee claims will not be accepted if a defect is connected with
   a) the effect of external mechanical or chemical influences on the appliance
   b) improper or excessive use of the appliance
   c) repair, maintenance or servicing by a third party whom the end user knows not to be a Mihm-Vogt specialist
   d) incorporation in the appliance of parts whose use has not been approved by Mihm-Vogt or which change the appliance in a way not approved by Mihm-Vogt
   e) failure to observe the instructions by Mihm-Vogt on the handling, servicing and care of the appliance (e.g. operating instructions), in particular if the scheduled services are not carried out
   f) failure by the end user to notify a defect and have it repaired as described in No. 3 immediately in the case of defects that were apparent at the time of delivery of the appliance or immediately on detection in the case of defects that became apparent later.
6. Recommendations for use, irrespective of whether they are given orally, in writing or during practical instruction, are based on experience and tests by Mihm-Vogt and can therefore be regarded as guidelines only. Mihm-Vogt products are subject to further development. Mihm-Vogt therefore reserves the right to make changes in design and composition.
7. All guarantee claims expire at the end of the warranty period defined in No. 1. For claims made but not rectified during the warranty period, the expiry date is extended until the defect has been rectified. In this case the warranty expires two months at the latest after the last repair or statement by the Mihm-Vogt specialist dealer that the defect has been remedied or did not exist.
8. Claims by the purchaser against the supplying dealer are unaffected by this warranty.

MIHM-VOGT GmbH & Co. KG

January 2009

9.4 Circuit diagrams





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